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Liberati et al.

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(54) **APPLIANCE FAN ASSEMBLY**

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F04D 29/42 (2006.01)
F25D 17/04 (2006.01)

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CPC ***F25D 17/062*** (2013.01); ***F04D 29/4246*** (2013.01); ***F25D 17/045*** (2013.01); *F25D 2317/0681* (2013.01)

(58) **Field of Classification Search**
CPC F25D 17/062; F25D 17/045; F25D 2317/0681; F04D 29/4246
See application file for complete search history.

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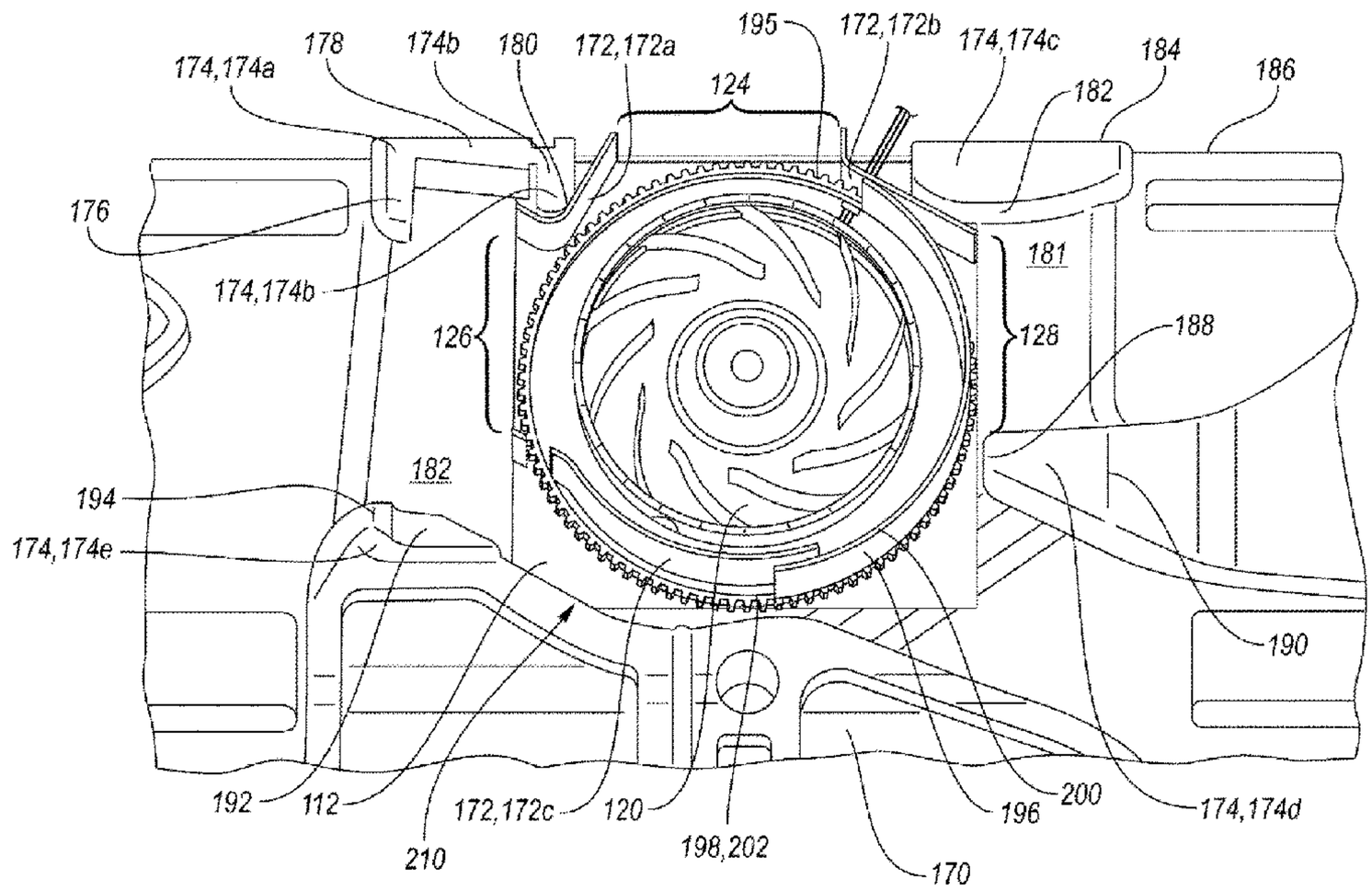
(57) **ABSTRACT**

A fan assembly including a housing, an impeller, a first damper member, a second damper member, and an actuation assembly. The housing defining a number of outlets and the impeller being configured to rotate about a rotational axis to direct air towards the number of outlets. The first damper member at least partially extending circumferentially about the impeller and the second damper member at least partially extend circumferentially about the impeller. The actuation assembly is configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block or completely open the number of outlets.

17 Claims, 7 Drawing Sheets



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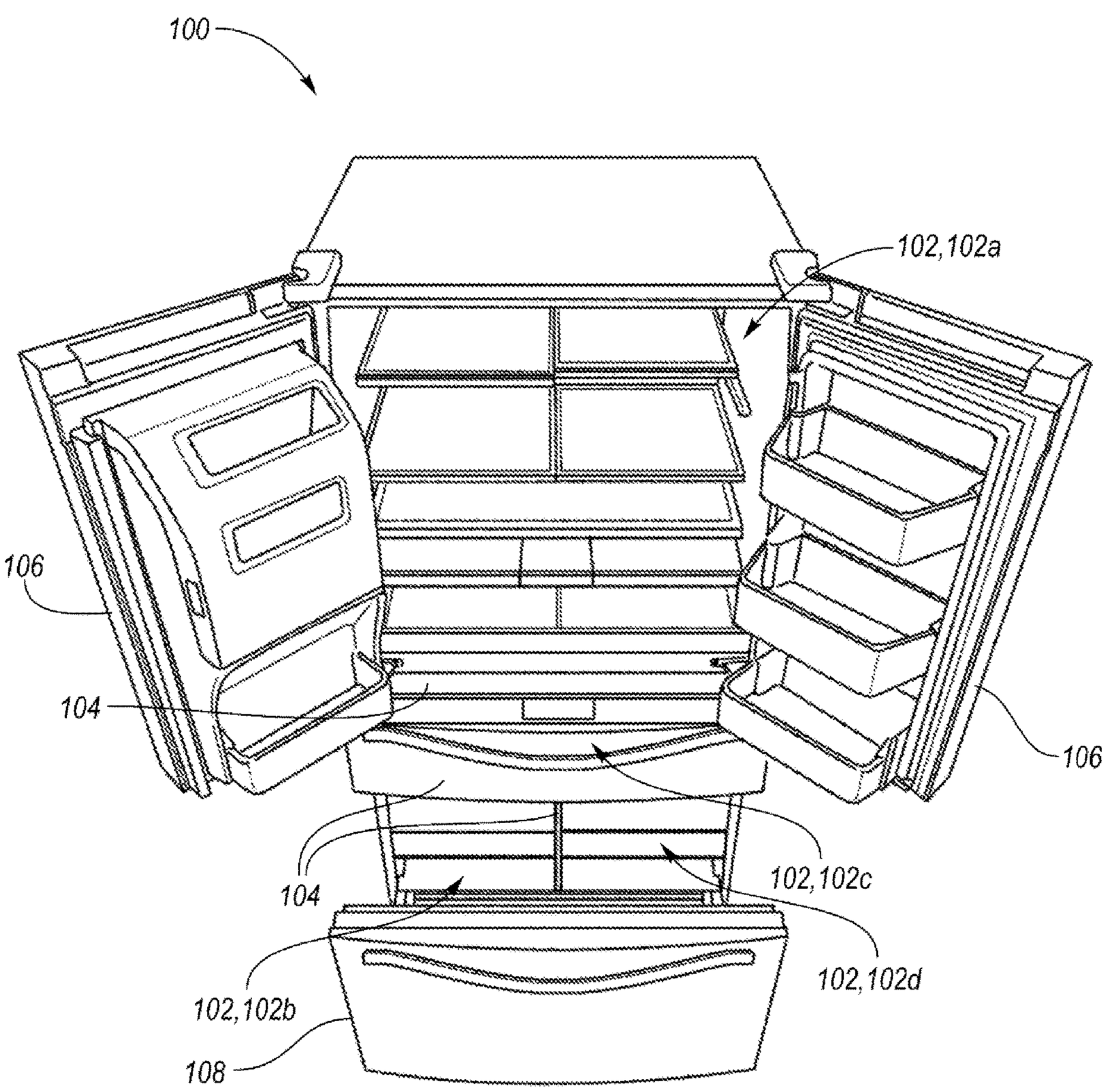
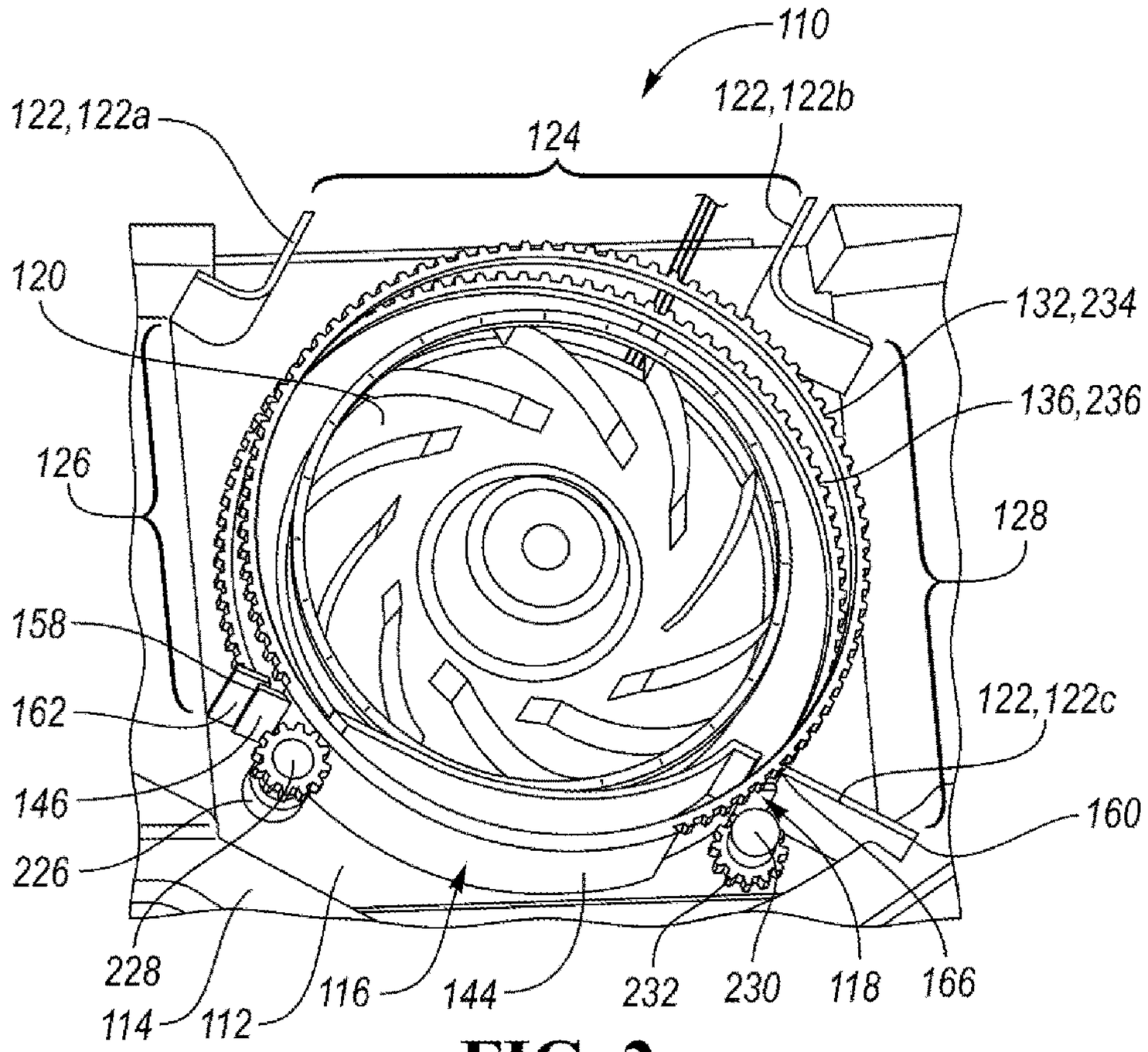


FIG. 1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228
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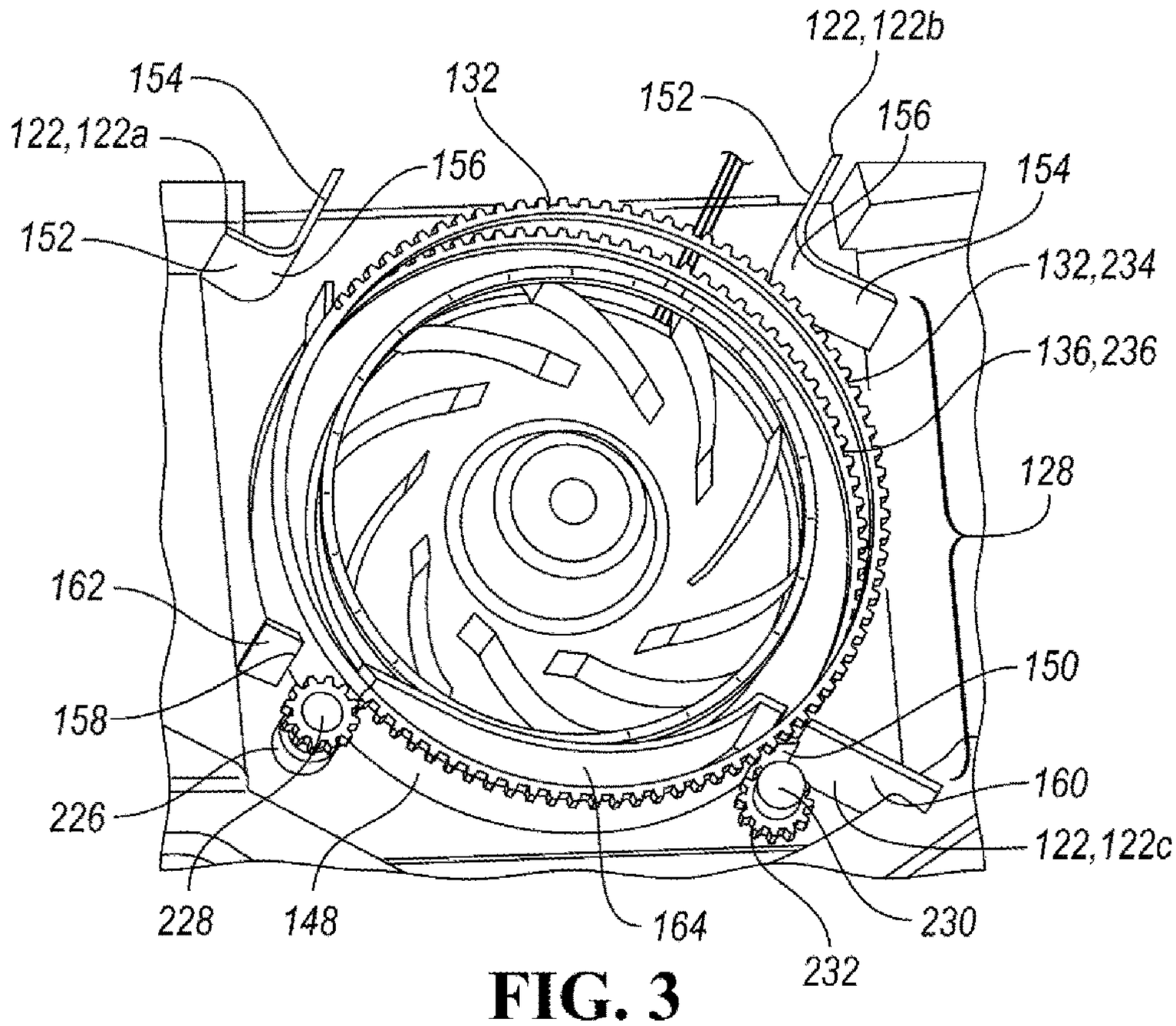
112
116
144
232
230
118
166

FIG. 2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230
232

FIG. 3

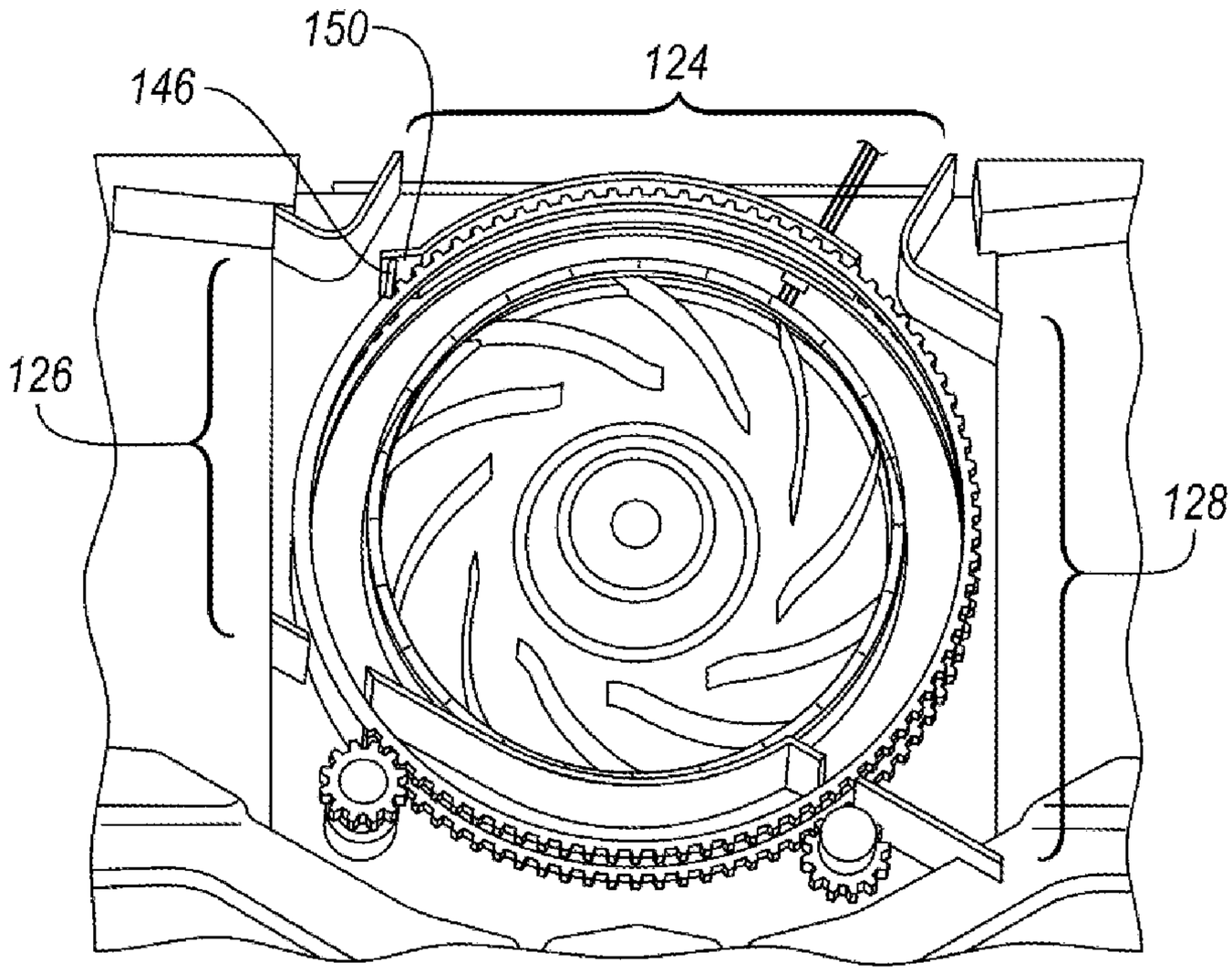


FIG. 4

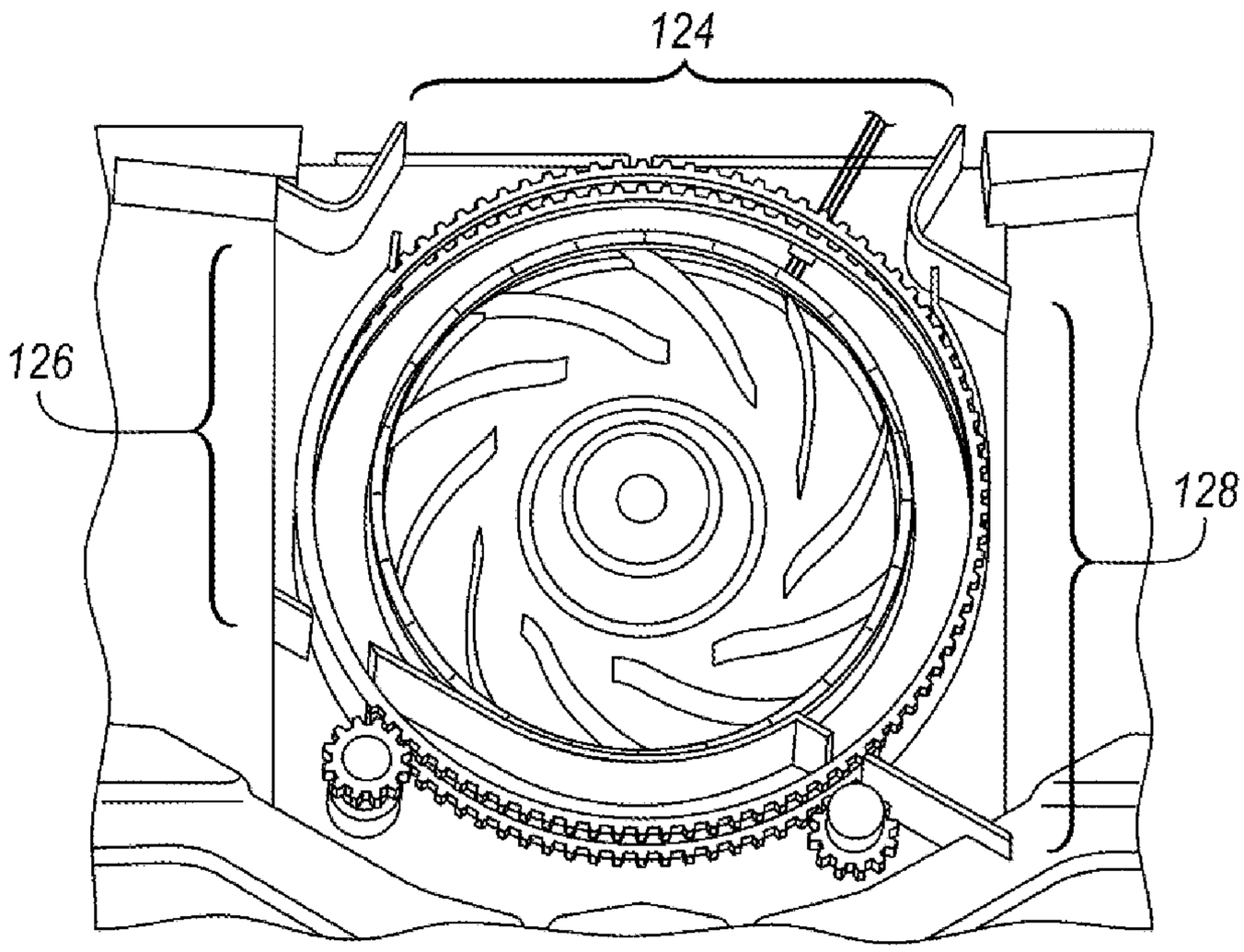


FIG. 5

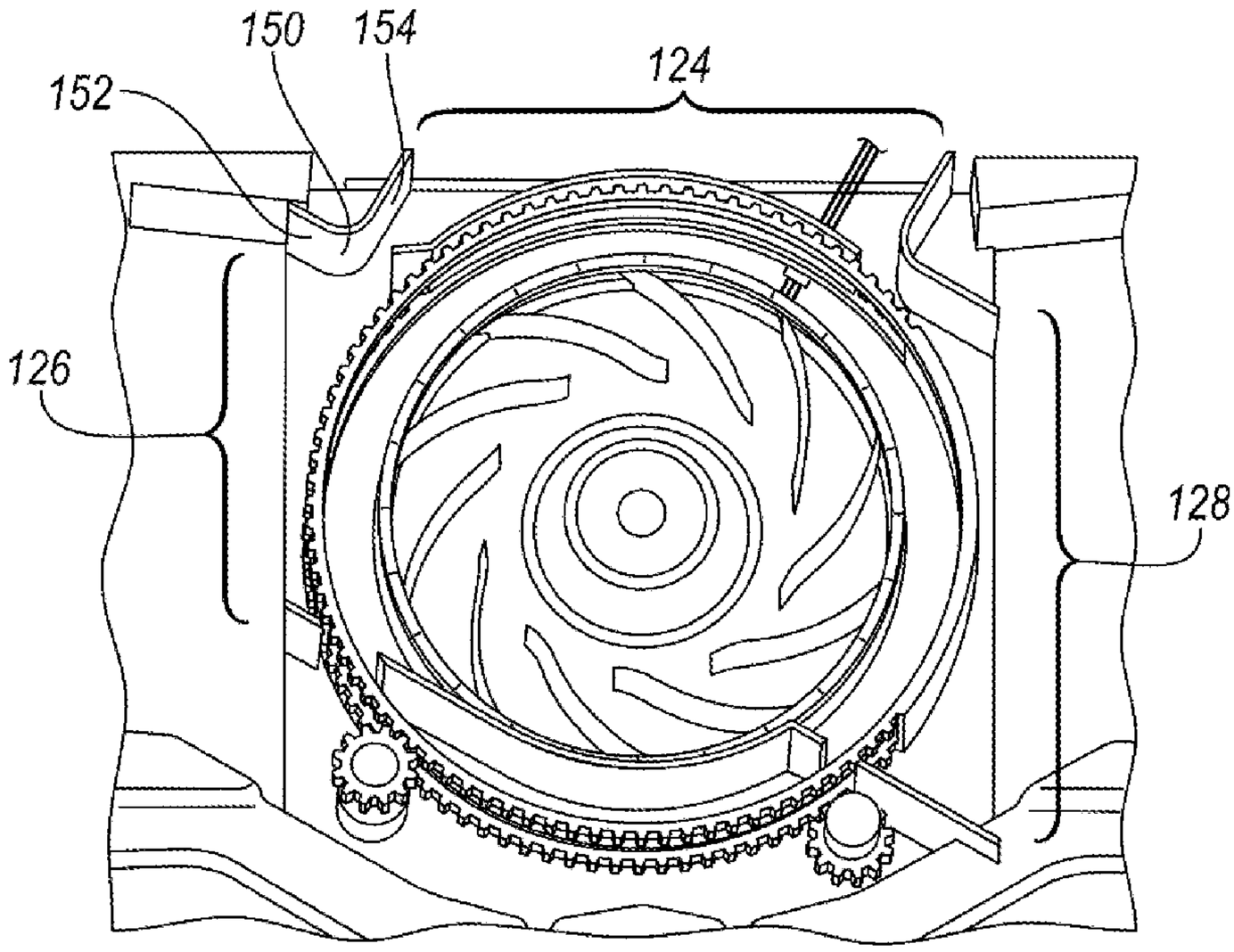


FIG. 6

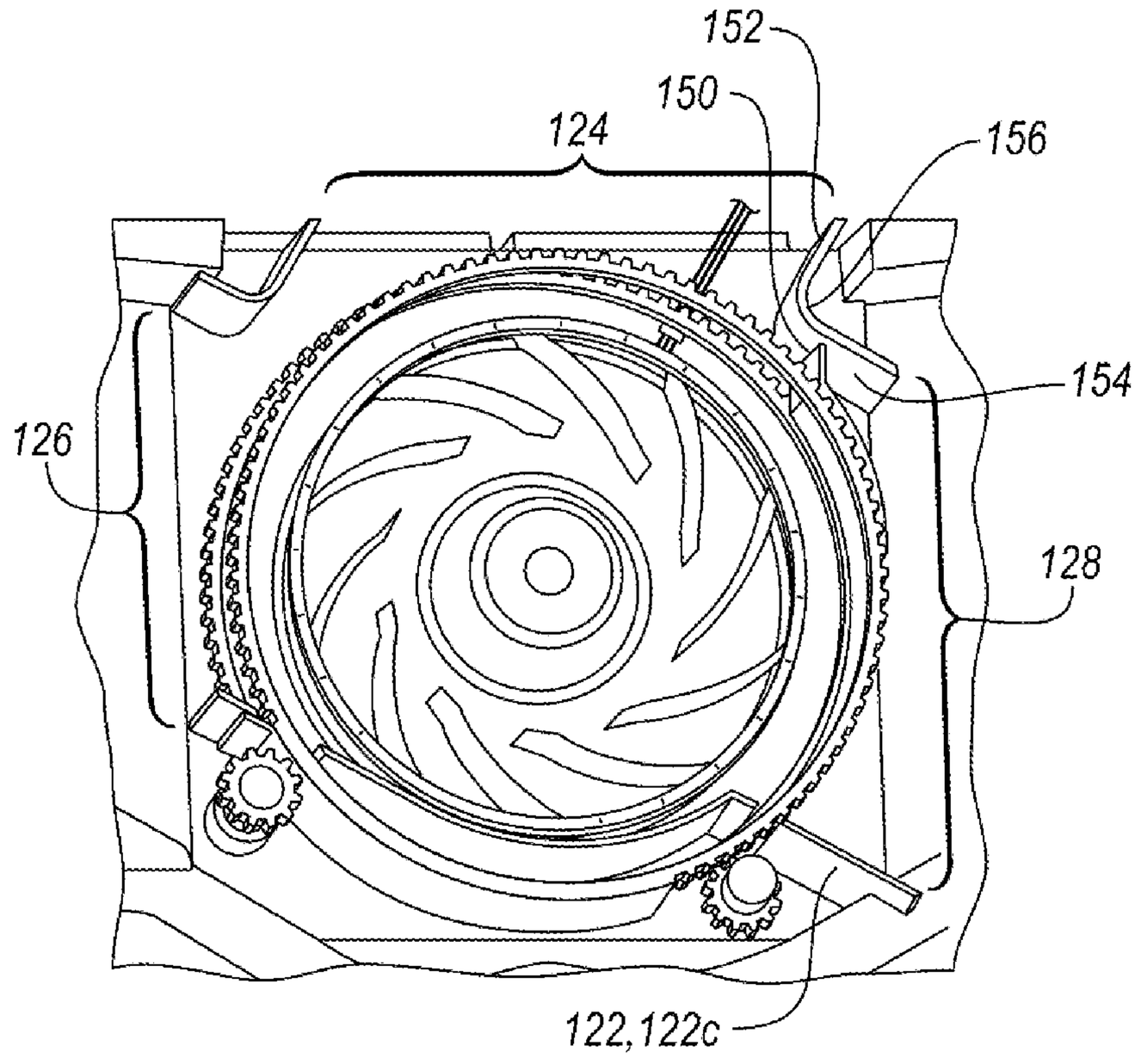


FIG. 7

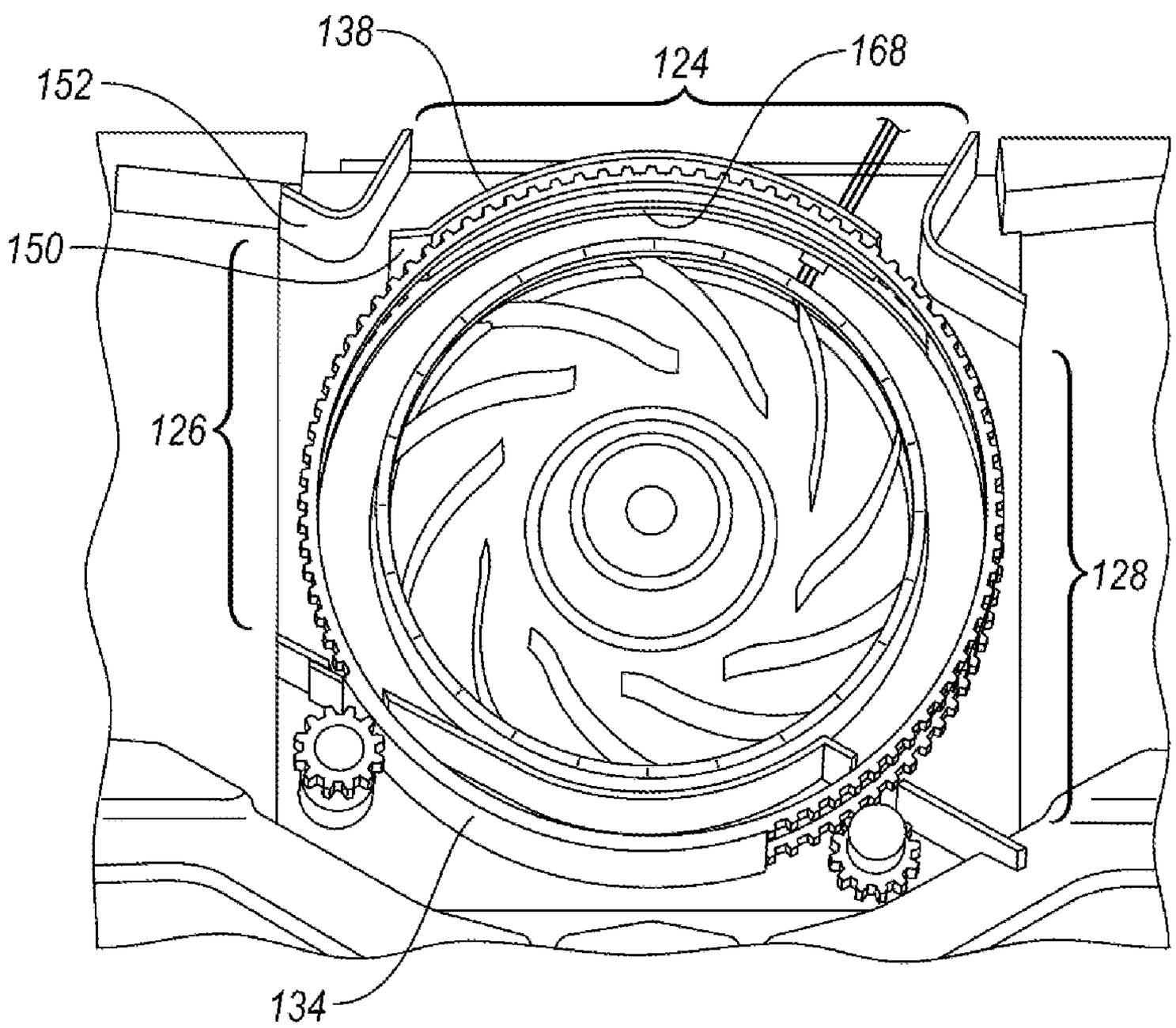
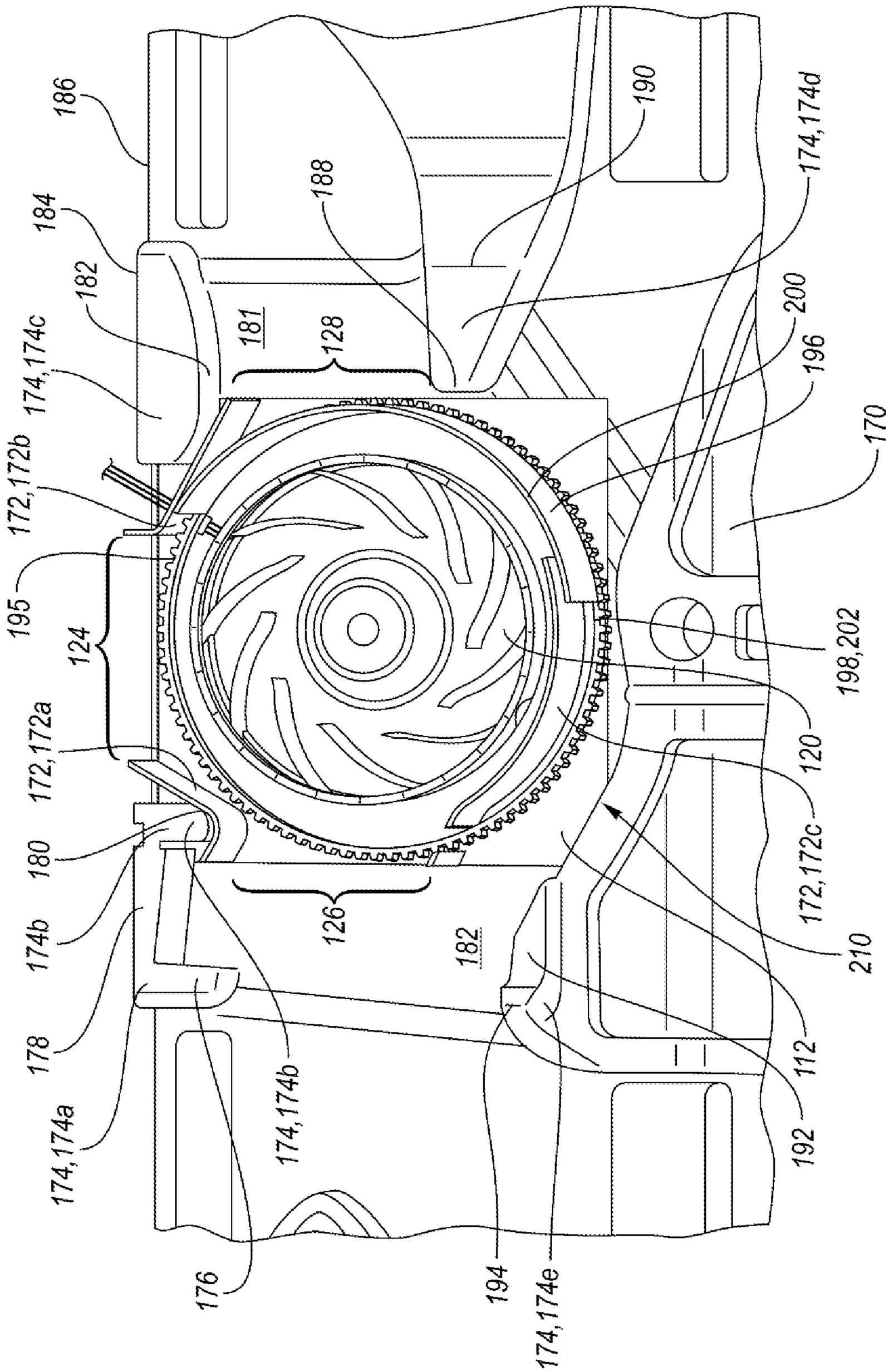


FIG. 8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174,174b

FIG. 9

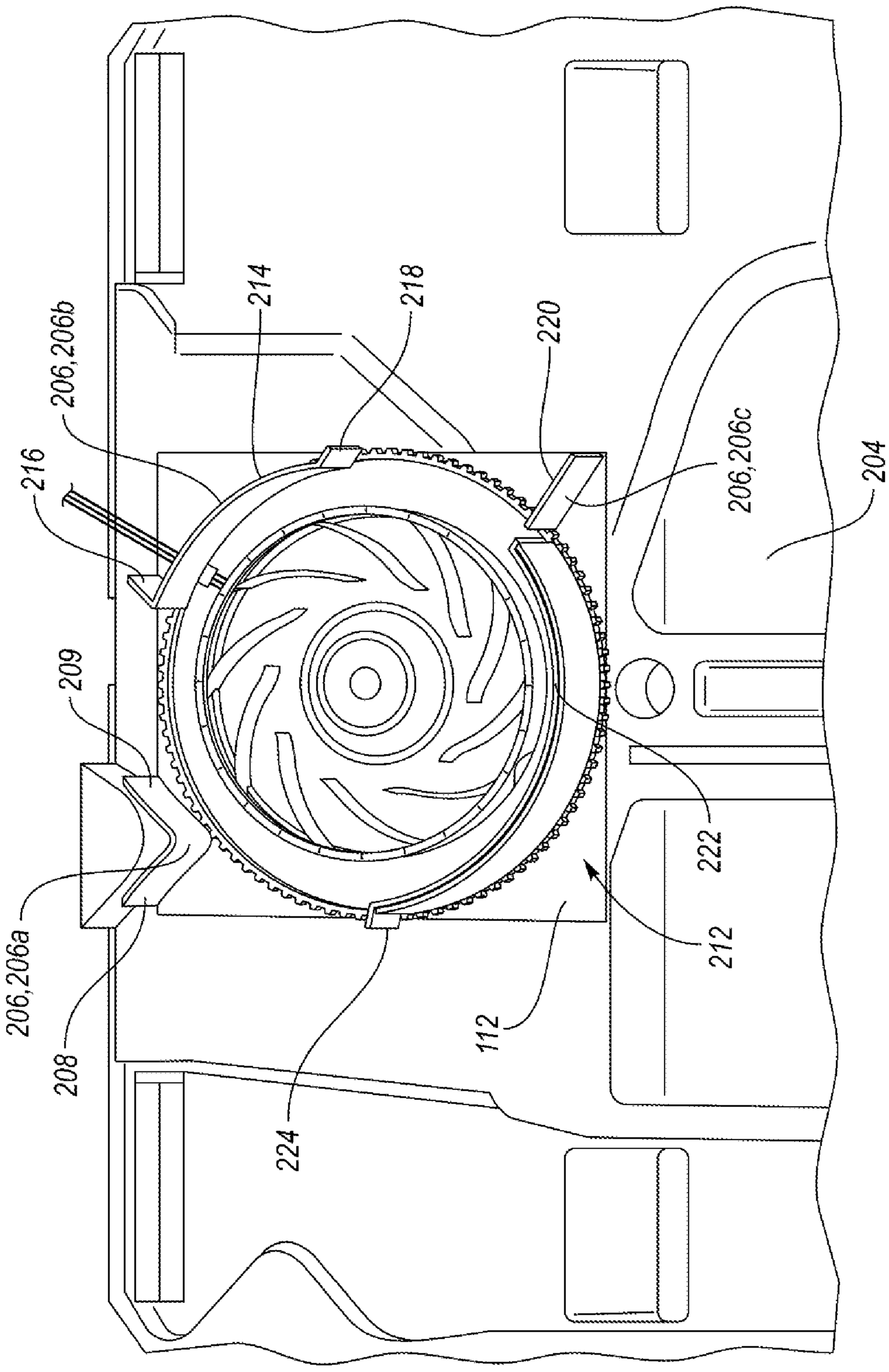
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FIG. 10

APPLIANCE FAN ASSEMBLY

TECHNICAL FIELD

The present disclosure relates to a fan assembly for use in household appliances such as refrigerators.

BACKGROUND

Refrigerators generally may include a fan assembly that controls or regulates the amount of cooled air provided to one or more compartments of the refrigerator. The fan assembly may be disposed in a cold air passage to maintain a desired temperature of each compartment. The fan assembly may include a frame provided with one or more openings or air passages that may route cooled air to the compartments and a damper that may be rotated by a motor to selectively open or close the air passages. The damper may be coaxially arranged between the fan and the frame and may move within a gap between the fan and the frame.

SUMMARY

According to one embodiment, a fan assembly for use in an appliance is provided. The fan assembly may include a housing, an impeller, a first damper member, a second damper member, and an actuation assembly. The housing may define a number of outlets and the impeller may be configured to rotate about a rotational axis to direct air towards the number of outlets. The first damper member may at least partially extend circumferentially about the impeller and the second damper member may at least partially extend circumferentially about the impeller. The actuation assembly may be configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block or completely open the number of outlets.

According to another embodiment, an air supply device for use in a refrigerator is provided. The refrigerator may include a freezer compartment, a refrigerator compartment, and a convertible compartment. The air supply device may include an impeller, a first damper member, a second damper member, and an actuation assembly. The impeller may be configured to rotate about a rotational axis to provide direct air towards a number of outlets fluidly that may be connected to the freezer compartment, the refrigerator compartment, and the convertible compartment. The first damper member may include a first sidewall that may at least partially extend circumferentially about the impeller. The second damper member may at least partially extend circumferentially about the impeller and may be disposed radially between the impeller and the first damper member. The actuation assembly may be configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block, or completely open at least one of the number of outlets.

According to yet another embodiment, a refrigerator is provided. The refrigerator may include a number of compartments, a panel, an impeller, a number of damper members, and an actuation assembly. The number of compartments may be formed by a number of mullions and walls of the refrigerator. The panel may be covered by one or more inner walls of the number of compartments. The panel may include a base surface and a number of protrusions that may collectively form a number of channels that may each be fluidly connected to one or more compartments of the number of compartments. The impeller may be rotationally coupled to the panel and configured to rotate about a rotational axis to direct air towards the number of outlets. The number of damper members may at least partially extend circumferentially about the impeller. The actuation assembly may be configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block or completely open the number of channels.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates a front-perspective view of an exemplary refrigerator.

FIG. **2** illustrates a perspective view of an exemplary fan assembly provided with damper members in a first position.

FIG. **3** illustrates a perspective view of the exemplary fan assembly provided with damper members in a second position.

FIG. **4** illustrates a perspective view of the exemplary fan assembly provided with damper members in a third position.

FIG. **5** illustrates a perspective view of the exemplary fan assembly provided with damper members in a fourth position.

FIG. **6** illustrates a perspective view of the exemplary fan assembly provided with damper members in a fifth position.

FIG. **7** illustrates a perspective view of the exemplary fan assembly provided with damper members in a sixth position.

FIG. **8** illustrates a perspective view of the exemplary fan assembly provided with damper members in a seventh position.

FIG. **9** illustrates a perspective view of another exemplary fan assembly.

FIG. **10** illustrates a perspective view of another exemplary fan assembly.

DETAILED DESCRIPTION

As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the invention that may be embodied in various and alternative forms. The figures are not necessarily to scale; some features may be exaggerated or minimized to show details of particular components. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a representative basis for teaching one skilled in the art to variously employ the present invention.

This invention is not limited to the specific embodiments and methods described below, as specific components and/or conditions may, of course, vary. Furthermore, the terminology used herein is used only for the purpose of describing particular embodiments of the present invention and is not intended to be limiting in any way.

As used in the specification and the appended claims, the singular form "a," "an," and "the" comprise plural referents unless the context clearly indicates otherwise. For example, reference to a component in the singular is intended to comprise a plurality of components.

The term "substantially" or "about" may be used herein to describe disclosed or claimed embodiments. The term "substantially" or "about" may modify a value or relative characteristic disclosed or claimed in the present disclosure. In such instances, "substantially" or "about" may signify that the value or relative characteristic it modifies is within ±0%, 0.1%, 0.5%, 1%, 2%, 3%, 4%, 5% or 10% of the value or relative characteristic.

When an element or layer is referred to as being "on," "engaged to," "connected to," or "coupled to" another element or layer, it may be directly on, engaged, connected or coupled to the other element or layer, or intervening elements or layers may be present. In contrast, when an element is referred to as being "directly on," "directly engaged to," "directly connected to," or "directly coupled to" another element or layer, there may be no intervening elements or layers present. Other words used to describe the relationship between elements should be interpreted in a like fashion (e.g., "between" versus "directly between," "adjacent" versus "directly adjacent," etc.). The term "and/or" includes any and all combinations of one or more of the associated listed items.

Although the terms first, second, third, etc. may be used to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as "first," "second," and other numerical terms when used herein do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer or section discussed below could be termed a second element, component, region, layer or section without departing from the teachings of the example embodiments.

Spatially relative terms, such as "inner," "outer," "beneath," "below," "lower," "above," "upper," and the like, may be used for ease of description to describe one element or feature's relationship to another element(s) or feature(s) as illustrated in the figures. Spatially relative terms may be intended to encompass different orientations of the device in use or operation in addition to the orientation depicted in the figures. For example, if the device in the figures is turned over, elements described as "below" or "beneath" other elements or features would then be oriented "above" the other elements or features. Thus, the example term "below" can encompass both an orientation of above and below. The device may be otherwise oriented (rotated 90 degrees or at other orientations) and the spatially relative descriptors used herein interpreted accordingly.

FIG. **1** generally shows the refrigerator **100**. The refrigerator may be of the French-Door Bottom Mount type, but it is understood that this disclosure could apply to any type of refrigerator, such as a side-by-side, two-door bottom mount, or top-mount type. As shown in FIG. **1**, the refrigerator **100** may include a number of storage compartments **102**. The storage compartments may include a first internal storage chamber or a refrigerated compartment **102***a*, a convertible storage compartment **102***b*, and a freezer compartment **102***c*. The convertible storage compartment **102***b*, may be disposed between the refrigerator compartment **102***a* and the freezer compartment **102***c*. However, the compartments **102** may be arranged in a variety of arrangements. Each of the compartments **102** may be divided by a mullion or divider **104** configured to insulate the compartments from one another for independent temperature control. Additionally, one or more of the compartments **102** may be controlled to adjust in temperature such that the compartments **102** may be implemented to store frozen or fresh items.

Though the convertible compartment **102***b* is depicted in FIG. **1** as being positioned between the refrigerator compartment **102***a* and the freezer compartment **102***c*, a convertible compartment **102***d* may be implemented in a variety of configurations. For example, in some instances, the convertible compartment **102***d* may be arranged as a portion of the freezer compartment **102***c* and may be separated or divided by one of the mullions **104** or dividers to bisect the freezer compartment **102***c* or divide it into various proportions. In general, each of the compartments **102***a*-**102***d* may be accessible via one or more doors. As shown, the fresh food compartment doors are designated **106**, and the freezer door is designated **108**. It may also be shown that the refrigerated compartment **102***a* may only have one door **106**. As example, each of the compartments **102** divided by seals that may interact with the mullions **104** to insulate the compartments **102** from each other. Accordingly, the refrigerator **100** may be flexibly implemented in a variety of configurations.

The temperature of the convertible compartment **102***b* may be rapidly adjusted over a number of setpoints, which may range from approximately −25 degrees centigrade to 15 degrees centigrade. Such a temperature range may correspond to temperatures that may be implemented to store a variety of goods. However, other temperatures or ranges of temperatures may be implemented and achieved via a controller provided with a memory programmed to adjust the temperature of the convertible compartment **102***b*. As an example, the controller (not illustrated) may adjust one or more of the damper sidewalls to provide warm or cool air to the convertible compartment **102***b*.

Referring generally to the figures, a fan assembly **110** for use in the refrigerator **100** is provided. The fan assembly include a base member **112** that may be disposed on a wall **114** disposed behind or below one or more of the compartments **102**. The base member **112** may define an opening in which a fan or impeller **120** extends through. The impeller **120** may be configured to rotate about a rotational axis R to direct warm or cool air to a number of outlets **124**, **126**, **128** that may each be fluidly connected to the compartments **102**.

A number of deflectors **122** may extend from the base member **112** to form one or more ducts or outlets. As an example, the number of outlets may include a refrigerator outlet **124**, that may be fluidly connected to the refrigerator compartment **102***a* to supply air from the impeller **120** to the refrigerator compartment **102***a*, a convertible compartment outlet **126**, that may be fluidly connected to the convertible compartment **102***b* to supply air from the impeller **120** to the convertible compartment **102***b*, and a freezer outlet **128** that may be fluidly connected to the freezer compartment **102***c* to supply air from the impeller **120** to the freezer compartment **102***c*.

The fan assembly **110** may include a first damper member **116** and a second damper member **118**. The first and second damper members **116**, **118** may circumferentially extend about the impeller **120** and an actuation assembly **130** may be operatively connected to the first damper member **116**, the second damper member **118**, or both. The actuation assembly **130** may be configured to selectively rotate the first and second damper members **116**, **118** to partially block, completely block, or completely open at least one of the number of outlets **124**, **126**, **128**. Blocking one or more of the outlets **124**, **126**, **128**, while opening the other outlets **124**, **126**, **128**, may permit a volume of air that would have been otherwise provided to the other outlets so that the temperature of the compartments **102** fluidly connected to the outlets **124**, **126**, **128** may raised or lowered as desired in a relatively short period of time.

In one or more embodiments, the first damper member **116** may include a first annular ring **132** and a first damper sidewall **134** that may extend from the first annular ring **132** and the second damper member **118** may include a second annular ring **136** and a second damper sidewall **138** that may

extend from the second annular ring **136**. As an example, the first annular ring **132** may be spaced apart from the base member **112** and the second annular ring may lie along or move along the base member **112**. The impeller **120** may include a number of vanes **140** and a band **142** that may extend between distal ends of each of the vanes **140** The distal ends of the vanes **140** and/or the band **142** may form an outer periphery of the impeller **120**. The first sidewall **134** may be radially spaced apart from the outer periphery of the impeller **120** and the second sidewall **138** may be disposed radially between the first sidewall **134** and the impeller **120**.

The first sidewall **134** may include a first circumferential portion **144** and a first tangential portion **146**. The first circumferential portion **144** may be curved and may extend circumferentially about the outer periphery of the impeller **120** and the first tangential portion **146** may be substantially straight and extend in a substantially tangential direction with respect to the first circumferential portion **144**. The second sidewall may include a second circumferential portion **148** and a second tangential portion **150**. The second circumferential portion **148** may be curved and extend circumferentially about the outer periphery of the impeller **120** and the second tangential portion **150** may be substantially straight and extend in a substantially tangential direction with respect to the second circumferential portion **148**. The first and second tangential portions **146**, **150**

The fan assembly **110** may include the number of deflectors **122** that may include a first deflector **122***a*, a second deflector **122***b*, and a third deflector **122***c*. The first deflector **122***a* and the second deflector **122***b* may form the refrigerator outlet **124**. The first deflector **122***a* and a first end of the third deflector **122***c* may form the convertible compartment outlet **126** and a second end of the third deflector **122***c* and the second deflector **122***b* may form the freezer compartment outlet **128**. The first and second deflectors **122***a*, **122***b* may be V-shaped and may include first and second arms **152**, **154** that may be connected to one another by a curved portion **156**. Alternatively or additionally, the third deflector may include a first distal portion **160**, a second distal portion **162**, and a medial portion **164** extending therebetween. As an example, the first and second distal portions **160**, **162** may each be substantially straight and the medial portion **164** may be curved so as to circumferentially extend about an outer periphery of the impeller **120**.

In one or more embodiments, the first and second damper members **116**, **118** may be adjusted by one or more actuation assemblies. A first actuation assembly may include a first motor **226** and a first gear **228** that may be operatively coupled to the first motor **226**. The first gear **228** may be spaced apart from the base member **112** and configured to engage one or more teeth **234** that may be formed by the first annular ring **132**. A second actuation assembly may include a second motor **230** and a second gear **232** that may be operatively coupled to the second motor **230** and configured to engage one or more teeth **236** of the second annular ring **136**.

FIG. **2** illustrates a perspective view of the fan assembly **110** according to one or more embodiments. The fan assembly **110** may include the impeller **120** and the first and second damper members **116**, **118** may be disposed in a first position in which the first and second damper members **116**, **118** do not block the refrigerator outlet **124**, the convertible compartment outlet **126**, or the freezer outlet **128** so that each of the outlets **124**, **126**, **128** are opened. In one or more embodiments, the first and second damper members **116**, **118** may be arranged coaxial to one another, or concentric to one another, or both. The first damper member **116** may include the first annular ring **132** and the first sidewall **134** and the second damper member **118** may include the second annular ring **136** and the second sidewall **138**. The annular rings **132**, **136** may each have a rectangular shape that is bent to extend in the circumferential direction.

When the first and second damper members **116**, **118** are in the first position, the first sidewall **134** may cover the second sidewall **138** in the radial direction. Alternatively or additionally, the first sidewall **134** and the second sidewall **138** may each cover the medial portion **164** in the radial direction. As an example, the first tangential portion **146** may lie against or be adjacent to the second distal portion **162** of the third deflector and the second tangential portion **150** may lie against or be adjacent to the first distal portion **160**. In one or more embodiments, the first annular ring **132** may be disposed above the second distal portion **162** and the second annular ring **136** may extend below the second distal portion **162**. As another example, the second distal portion **162** may define a slot **158** and the first and second damper members **116**, **118** including the first annular ring **132**, the first sidewall **134**, the second annular ring **136**, and the second sidewall **138** move in and out of. In one or more embodiments, the first distal portion **160** of the third deflector **122***c* may define a slot **166** and the first and second damper members **116**, **118** including the first annular ring **132**, the first sidewall **134**, the second annular ring **136**, and the second sidewall **138** may move in and out of the slot **166**.

The first motor **226** and the first gear **228** and the second motor **230** and the second gear **232** may each be disposed adjacent to the third deflector **122***c*. However, the first and second motors **226**, **230** and the first and second gears **228**, **232** may each be coupled to the base member **112** in one or more other suitable positions so that the first and second gears **228**, **232** may engage the teeth **234**, **236** of the first and second annular rings **132**, **136**.

FIG. **3** illustrates a plan view of the fan assembly **110** provided with the first and second damper members **116**, **118** in a second position, in which the convertible compartment outlet **126** is closed and the refrigerator compartment outlet **124** and freezer compartment outlet **128** are each open. When the first and second damper members **116**, **118** are in the second position, portions of the first sidewall **134** may at least partially overlap or cover the second sidewall **138**. The first annular ring **132** may be disposed above, such as in the axial direction, and radially inward with respect to the second sidewall **138**. The first tangential portion **146** may extend in a direction that is substantially parallel to the first deflection member **122***a* to direct air towards the second arm **154** and the refrigerator outlet **124**. The first tangential portion **146** may be positioned to prevent or block air flowing to the convertible compartment outlet **126**.

FIG. **4** illustrates a plan view of the fan assembly **110** provided with the first and second damper members **116**, **118** in a third position, in which the freezer compartment outlet **128** is open and the refrigerator outlet **124** and the convertible compartment **126** are closed. When the first and second damper members **116**, **118** are in the third position, the first tangential portion **146** and the second tangential portion **150** may contact one another to close a gap disposed between the first circumferential portion **144** and the second circumferential portion **148**. As an example, the second sidewall **138** may block the freezer compartment outlet **128** and the first sidewall **134** may block the convertible compartment outlet **126**.

FIG. **5** illustrates a plan view of the fan assembly **110** provided with the first and second damper members **116**, **118** in a fourth position, in which the refrigerator compartment

outlet **124** is open and the convertible compartment **126** and the freezer outlet **128** are each closed. As an example, the second sidewall **138** may block the freezer compartment outlet **127** and the first sidewall **134** may block the convertible compartment **126**.

FIG. **6** illustrates a plan view of the fan assembly **110** provided with the first and second damper members **116**, **118** in a fifth position, in which the convertible compartment outlet **126** is open and the refrigerator compartment outlet **124** and the freezer outlet **128** are each closed. As an example, the second sidewall **138** may block the refrigerator compartment outlet **124** and the first sidewall **134** may block the freezer compartment outlet **128**. The second tangential portion **150** may extend towards the curved portion **156** of the first deflector **122***a*. The second tangential portion **150** may be configured to direct air towards the first deflector **122***a* and the freezer compartment outlet **128**.

FIG. **7** illustrates a perspective view of the fan assembly **110** provided with the first and second damper members **116**, **118** in a sixth position, in which the convertible compartment outlet **126** and the refrigerator compartment outlet **124** are each open and the freezer compartment outlet **128** is closed. As an example, the second sidewall **138** may block the freezer compartment outlet **128** and the first sidewall **134** may be positioned to radially cover or overlap portions of the third deflector **122***c*. The second tangential portion **150** of the second sidewall **138** may extend towards the second arm **154** of the second deflector **122***b* so that air is directed towards the second deflector **122***b* and the refrigerator outlet **124**.

FIG. **8** illustrates a perspective view of the fan assembly **110** provided with the first and second damper members **116**, **118** in a seventh position, in which the convertible compartment outlet **126** and the freezer compartment outlet **128** are each open and the refrigerator compartment outlet **124** is closed. As an example, the second sidewall **138** may block the refrigerator compartment outlet **124** and the first sidewall **134** may be positioned to radially cover or overlap portions of the third deflector **122***c*. The second tangential portion **150** of the second sidewall **138** may extend towards or parallel to the first leg **153** of the first deflector **122***a* so that air is directed towards the first deflector **122***a* and the convertible compartment outlet **126**.

In one or more embodiments, the second sidewall **138** may be spaced apart from an inner periphery **168** of the second annular ring **136**.

FIG. **9** illustrates a perspective view of a portion of the refrigerator **100** that includes a panel **170** and an exemplary fan assembly **210**. The base member **112** may be disposed on the panel **170** and the impeller **120** may be rotationally coupled to the panel **170** and extend through the base member **112**. A number of deflectors **172** may be fixed to the base member **112** to form the refrigerator compartment outlet **124**, the convertible compartment outlet **126**, and the freezer compartment outlet **128**. As an example, the number of deflectors **172** may include a first deflector **172***a*, a second deflector **172***b*, and a third deflector **172***c*.

The panel **170** may include a number of protrusions **174** and the number of protrusions **174** and the number of deflectors **172** may collectively form the refrigerator compartment outlet **124**, the convertible compartment outlet **126**, and the freezer compartment outlet **128**. As an example, the number of protrusions may include a first protrusion **174***a* that may include a first segment **176** and a second segment **178** that may be arranged substantially orthogonally to the first segment **176**. The first segment **176** may form an inner periphery of the refrigerator outlet compartment **126** and may include an inner surface and an outer surface, the inner surface spaced closer to the impeller **120** than the outer surface. As an example, the outer surface may be curved, and the inner surface may be relatively straight. The curved outer surface may be configured to mitigate or prevent turbulent air flow through the refrigerator compartment outlet **126**.

A second protrusion **174***b* may be disposed between the first deflector **172***a* and the first protrusion **174***a*. For example, the second protrusion **174***b* may be connected e.g., integrally formed to the first protrusion **174***a*. The second protrusion **174***b* may include a curved surface **180** that may be adjacent to or contact the first deflector **172***a*. The first and second protrusions **174***a*, **174***b* may be spaced on a first side of the refrigerator compartment outlet **124** and a third protrusion **174***c* may be disposed on a second side of the refrigerator compartment outlet **124**. The third protrusion **174***c* may have a flat-bottom airfoil shape provided with a curved inner surface, **182** that may face the impeller **120**, and a flat surface that may form or face an outer periphery **186** of the panel **170**.

In one or more embodiments, the panel **170** may include a fourth protrusion **174***d* that may be spaced apart from the third protrusion **174***c* away from the outer periphery **186**. As an example, the fourth protrusion may have a substantially triangular shape including a vertex **188** and a base **190**. The vertex **188** may be disposed closer to the impeller **120** than the base **190**. The panel **170** may include a fifth protrusion **174***e* that may be spaced apart from the first protrusion **174***a* on the other side of the convertible compartment outlet **126**. As an example, the fifth protrusion **174***e* may include a first section **192**, that may extend in a direction that is parallel to the second section **178** of the first protrusion **174***a*, and a second section **194** that may extend substantially orthogonally to the first section **194**.

The protrusions **174** may form one or more channels **181**, **182**, **195** that may be fluidly connected to the outlets **124**, **126**, **128**. The third protrusion **174***c* and the fourth protrusion **174***d* may form a first channel **181** that may be fluidly connected to the freezer compartment outlet **126**. The second protrusion **174***b* and the third protrusion **174***c* may collectively form a second channel that may be fluidly connected to the refrigerant compartment outlet **124**. The first protrusion **174***a* and the fifth protrusion **174***e* may form a third channel **182** that may be fluidly connected to the convertible compartment outlet **126**.

A damper member **196** may be rotationally fixed to the base **112** and configured to selectively rotate to partially block, completely block or completely open the number of outlets **124**, **126**, **128**. The damper member **196** may include an annular ring **198** and a sidewall **200** that may extend from an inner periphery **202** of the annular ring.

FIG. **10** illustrates a perspective view of a portion of the refrigerator **100** that includes an exemplary panel **204** and an exemplary fan assembly **212**. One or more deflectors **206** may extend from the base member **112**, including a first deflector **206***a*, a second deflector **206***b*, and a third deflector **206***c*. As an example, the first deflector **206***a* may include a first leg **208** and a second leg **209** that may extend orthogonally the first leg **208**. The second deflector **206***b* may include a curved portion **214**, a first radial extending portion **216**, and a second radial extending portion **218**. The first and second radial extending portions **216**, **218** may each extend from ends of the curved portion **214**. The third deflector **206***c* may include a first radial extending portion **220**, a second radial extending portion **224**, and a curved portion **222** that may extend therebetween.

While exemplary embodiments are described above, it is not intended that these embodiments describe all possible forms of the invention. Rather, the words used in the specification are words of description rather than limitation, and it is understood that various changes may be made without departing from the spirit and scope of the invention. Additionally, the features of various implementing embodiments may be combined to form further embodiments of the invention.

What is claimed is:

1. A fan assembly for use in an appliance including a housing defining a number of outlets, the fan assembly comprising:

an impeller configured to rotate about a rotational axis to direct air towards the number of outlets;

a first damper member at least partially extending circumferentially about the impeller;

a second damper member at least partially extending circumferentially about the impeller;

an actuation assembly configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block or completely open the number of outlets; and

a base member, wherein the impeller is disposed on the base member and the first damper member includes a first annular ring and a first sidewall, wherein the first annular ring is spaced apart from the base member and the first sidewall extends from the first annular ring towards the base member, wherein the second damper member includes a second annular ring and a second sidewall and wherein the second sidewall is disposed radially inward from the first sidewall.

2. The fan assembly of claim **1**, wherein the second annular ring lies along the base member and the second sidewall extends from the second annular ring.

3. The fan assembly of claim **2**, wherein the first sidewall is radially spaced apart from an outer periphery of the impeller.

4. The fan assembly of claim **1**, wherein the actuation assembly is configured to rotate the first damper member and the second damper member to an open position, in which the second sidewall radially covers the first sidewall.

5. The fan assembly of claim **3**, wherein the first sidewall includes a first portion and a second portion, wherein the first portion extends in a circumferential direction with respect to an outer periphery of the impeller and the second portion extends in a first tangential direction tangential to the circumferential direction.

6. The fan assembly of claim **4**, wherein the second sidewall includes a first portion and a second portion, wherein the first portion extends in the circumferential direction and the second portion extends in a second tangential direction tangential to the circumferential direction.

7. The fan assembly of claim **6**, wherein the actuation assembly is configured to rotate the first damper member and the second damper member to a first position, in which the first damper member blocks a first outlet of the number of outlets and the second damper member blocks a second outlet of the number of outlets, and the second portion of the first sidewall and the second portion of the second sidewall contact one another.

8. An air supply device for use in a refrigerator including a freezer compartment, a refrigerator compartment, and a convertible compartment, the air supply device comprising:

an impeller configured to rotate about a rotational axis to direct air towards a number of outlets fluidly connected to the freezer compartment, the refrigerator compartment, and the convertible compartment;

a first damper member including a first sidewall at least partially extending circumferentially about the impeller;

a second damper member at least partially extending circumferentially about the impeller and disposed radially between the impeller and the first damper member; and

an actuation assembly configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block or completely open at least one of the number of outlets; and

a base member, wherein the impeller is disposed on the base member, and the first damper member includes a first annular ring spaced apart from the base member, and wherein the first sidewall extends from the first annular ring towards the base member.

9. The air supply device of claim **8**, wherein the second damper member includes a second annular ring and a second sidewall, wherein the second annular ring lies along the base member and the second sidewall extends from the second annular ring.

10. The air supply device of claim **8**, further comprising:

a number of deflectors collectively arranged to form the number of outlets, wherein a first deflector of the number of deflectors defines a slot in which the first sidewall moves along as the first damper member rotates.

11. The air supply device of claim **10**, wherein the first deflector includes a first distal portion, a second distal portion, and a medial portion extending therebetween, wherein one of the first or second distal portions define the slot.

12. The air supply device of claim **11**, wherein the medial portion is curved and the first and second distal portions are substantially straight.

13. The air supply device of claim **8**, wherein the first damper member extends circumferentially about an entire circumference of the impeller.

14. A refrigerator comprising:

a number of compartments formed by a number of mullions and walls of the refrigerator;

a panel covered by one or more inner walls of the number of compartments, wherein the panel includes a base surface and a number of protrusions collectively forming a number of channels each fluidly connected to one or more compartments of the number of compartments;

an impeller rotationally coupled to the panel and configured to rotate about a rotational axis to direct air towards the number of outlets; and

a first damper member and a second damper member, each at least partially extending circumferentially about the impeller;

an actuation assembly configured to selectively rotate the first damper member and/or the second damper member to partially block, completely block or completely open the number of channels; and

a base member, wherein the impeller is disposed on the base member, and the first damper member includes a first annular ring and a first sidewall, the first annular ring spaced apart from the base member, and wherein the first sidewall extends from the first annular ring towards the base member.

15. The refrigerator of claim **14**, wherein a first protrusion and a second protrusion of the number of protrusions collectively form a first channel of the number of channels,

wherein the first and second protrusions each have flat portion and a curved portion collectively forming a flat-bottom airfoil shape.

16. The refrigerator of claim **15**, wherein the second protrusion and a third protrusion form a second channel of the number of channels, wherein the second protrusion has a substantially triangular shape.

17. The refrigerator of claim **16**, wherein the third protrusion includes a vertex and a base, and the vertex is disposed closer to the impeller than the base.

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